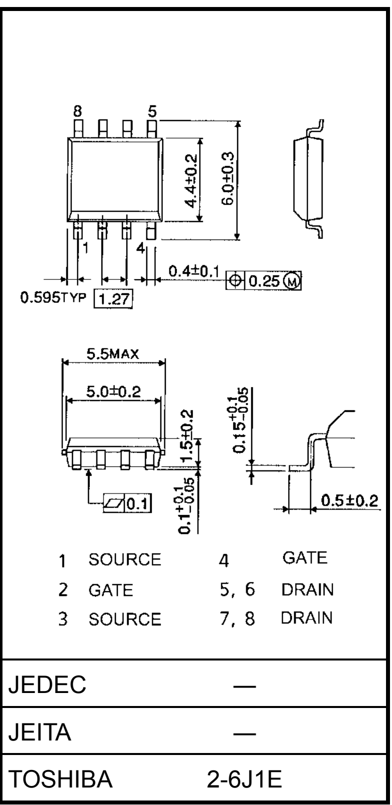
TOSHIBA Field Effect Transistor Silicon N Channel MOS Type (U−MOS III)

TPC8210

Lithium Ion Battery Applications
Portable Equipment Applications
Notebook PC Applications

Unit: mm



JEDEC	—
JEITA	—
TOSHIBA	2-6J1E

Weight: 0.08 g (typ.)

- Low drain−source ON resistance: $R_{DS\ (ON)}$ = 11 mΩ (typ.)
- High forward transfer admittance: $|Y_{fs}|$ = 13 S (typ.)
- Low leakage current: I_{DSS} = 10 μA (max) (V_{DS} = 30 V)
- Enhancement−mode: V_{th} = 1.3 to 2.5 V (V_{DS} = 10 V, I_D = 1 mA)

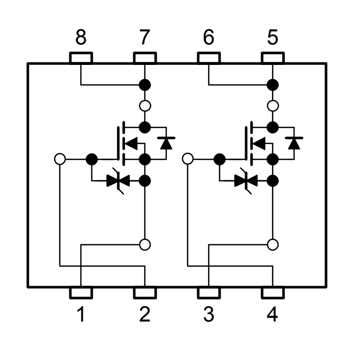
Maximum Ratings (Ta = 25°C)

Characteristics		Symbol	Rating	Unit
Drain-source voltage		V_{DSS}	30	V
Drain-gate voltage (R_{GS} = 20 kΩ)		V_{DGR}	30	V
Gate-source voltage		V_{GSS}	±20	V
Drain current	D C (Note 1)	I_D	8	A
	Pulse (Note 1)	I_{DP}	32	
Drain power dissipation (t = 10 s) (Note 2a)	Single-device operation (Note 3a)	$P_{D\ (1)}$	1.5	W
	Single-device value at dual operation (Note 3b)	$P_{D(2)}$	1.1	
Drain power dissipation (t = 10 s) (Note 2b)	Single-device operation (Note 3a)	$P_{D\ (1)}$	0.75	W
	Single-device value at dual operation (Note 3b)	$P_{D\ (2)}$	0.45	
Single pulse avalanche energy (Note 4)		E_{AS}	83.2	mJ
Avalanche current		I_{AR}	8	A
Repetitive avalanche energy Single-device value at dual operation (Note 2a, 3b, 5)		E_{AR}	0.1	mJ
Channel temperature		T_{ch}	150	°C
Storage temperature range		T_{stg}	−55 to 150	°C

Note: For (Note 1), (Note 2), (Note 3), (Note 4) and (Note 5), please refer to the next page.

This transistor is an electrostatic sensitive device. Please handle with caution.

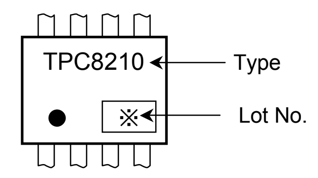
Circuit Configuration



Thermal Characteristics

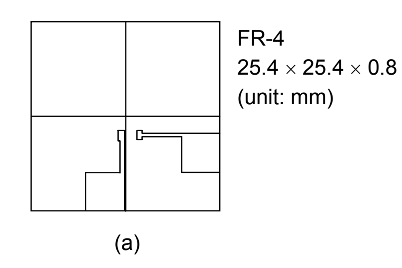
Characteristics		Symbol	Max	Unit
Thermal resistance, channel to ambient (t = 10 s) (Note 2a)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	83.3	°C/W
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	114	
Thermal resistance, channel to ambient (t = 10 s) (Note 2b)	Single-device operation (Note 3a)	$R_{th\ (ch\text{-}a)\ (1)}$	167	
	Single-device value at dual operation (Note 3b)	$R_{th\ (ch\text{-}a)\ (2)}$	278	

Marking (Note 6)

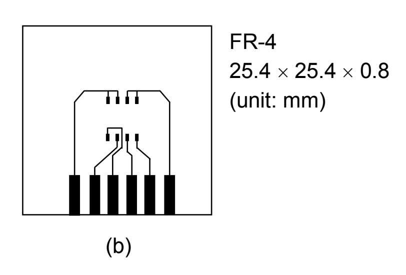


Note 1: Please use devices on condition that the channel temperature is below 150°C.

Note 2:



(a)



(b)

a) Device mounted on a glass-epoxy board (a)

b) Device mounted on a glass-epoxy board (b)

Note 3:

a) The power dissipation and thermal resistance values are shown for a single device.
(During single-device operation, power is only applied to one device.)

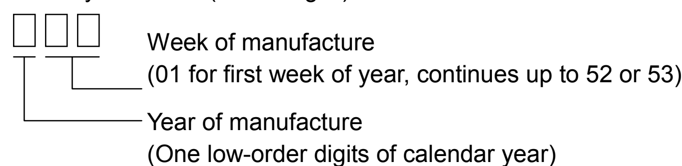
b) The power dissipation and thermal resistance values are shown for a single device.
(During dual operation, power is evenly applied to both devices.)

Note 4: V_{DD} = 24 V, T_{ch} = 25°C (initial), L = 1.0 mH, R_G = 25 Ω, I_{AR} = 8 A

Note 5: Repetitive rating: pulse width limited by maximum channel temperature

Note 6: • on lower left of the marking indicates Pin 1.

※ Weekly code: (Three digits)

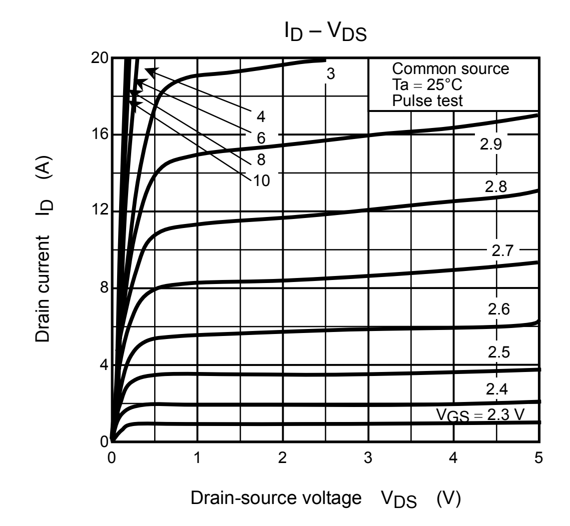


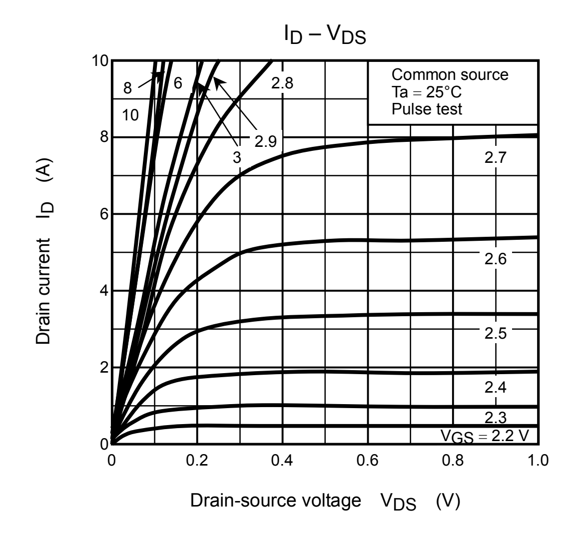
Electrical Characteristics (Ta = 25°C)

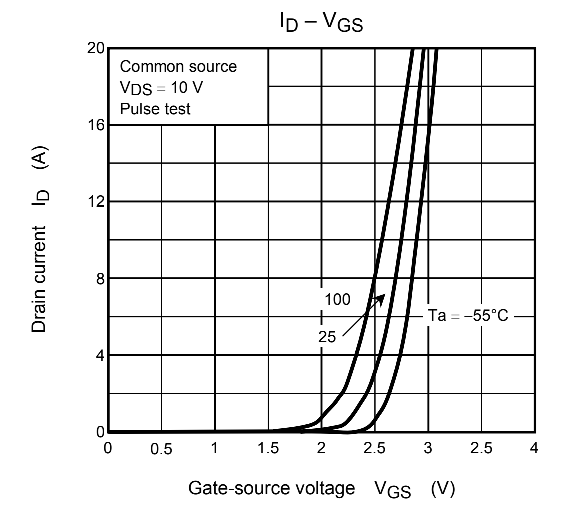
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Gate leakage current		I_{GSS}	V_{GS} = ±16 V, V_{DS} = 0 V	—	—	±10	μA
Drain cut−OFF current		I_{DSS}	V_{DS} = 30 V, V_{GS} = 0 V	—	—	10	μA
Drain−source breakdown voltage		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = 0 V	30	—	—	V
		$V_{(BR)\ DSS}$	I_D = 10 mA, V_{GS} = −20 V	15	—	—	
Gate threshold voltage		V_{th}	V_{DS} = 10 V, I_D = 1 mA	1.3	—	2.5	V
Drain−source ON resistance		$R_{DS\ (ON)}$	V_{GS} = 4.5 V, I_D = 4 A	—	13	20	mΩ
		$R_{DS\ (ON)}$	V_{GS} = 10 V, I_D = 4 A	—	11	15	
Forward transfer admittance		$\|Y_{fs}\|$	V_{DS} = 10 V, I_D = 4 A	6.5	13	—	S
Input capacitance		C_{iss}	V_{DS} = 10 V, V_{GS} = 0 V, f = 1 MHz	—	3530	—	pF
Reverse transfer capacitance		C_{rss}		—	495	—	
Output capacitance		C_{oss}		—	580	—	
Switching time	Rise time	tr	V_{GS} 10 V / 0 V, I_D = 4 A, V_{OUT}, 4.7 Ω, R_L = 3.7 Ω, V_{DD} ≃ 15 V, Duty ≦ 1%, t_w = 10 μs	—	26	—	ns
	Turn−ON time	t_{on}		—	39	—	
	Fall time	t_f		—	32	—	
	Turn−OFF time	t_{off}		—	115	—	
Total gate charge (Gate−source plus gate−drain)		Q_g	V_{DD} ≈ 24 V, V_{GS} = 10 V, I_D = 8 A	—	75	—	nC
Gate−source charge		Q_{gs}		—	6	—	
Gate−drain (“miller”) charge		Q_{gd}		—	19	—	

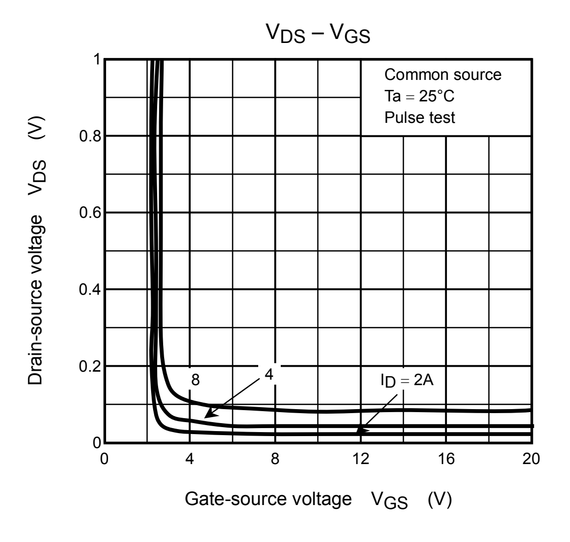
Source-Drain Ratings and Characteristics (Ta = 25°C)

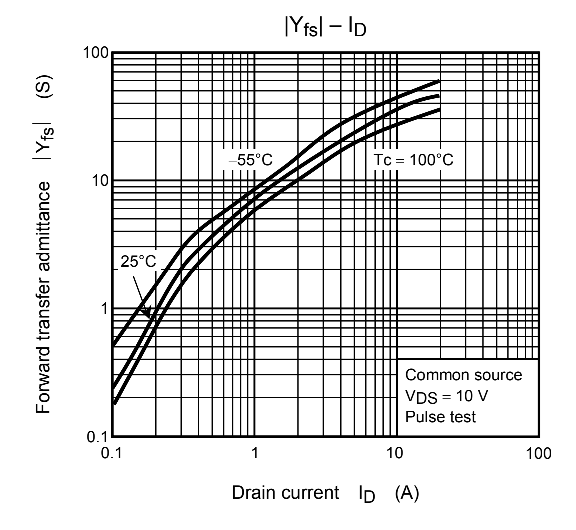
Characteristics		Symbol	Test Condition	Min	Typ.	Max	Unit
Drain reverse current	Pulse (Note 1)	I_{DRP}	—	—	—	32	A
Forward voltage (diode)		V_{DSF}	I_{DR} = 8 A, V_{GS} = 0 V	—	—	−1.2	V

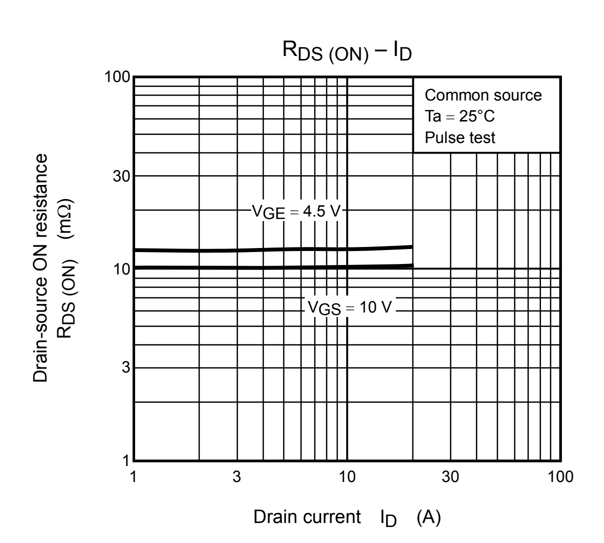

I_D – V_{DS}
Common source
Ta = 25°C
Pulse test
3
4
6
8
10
2.9
2.8
2.7
2.6
2.5
2.4
V_{GS} = 2.3 V
Drain current I_D (A)
Drain-source voltage V_{DS} (V)

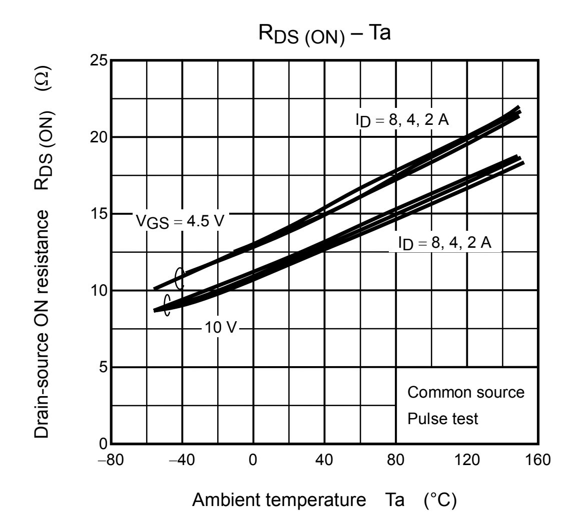

I_D – V_{DS}
Common source
Ta = 25°C
Pulse test
8
10
6
2.8
3
2.9
2.7
2.6
2.5
2.4
2.3
V_{GS} = 2.2 V
Drain current I_D (A)
Drain-source voltage V_{DS} (V)


I_D – V_{GS}
Common source
V_{DS} = 10 V
Pulse test
100
25
Ta = −55°C
Drain current I_D (A)
Gate-source voltage V_{GS} (V)

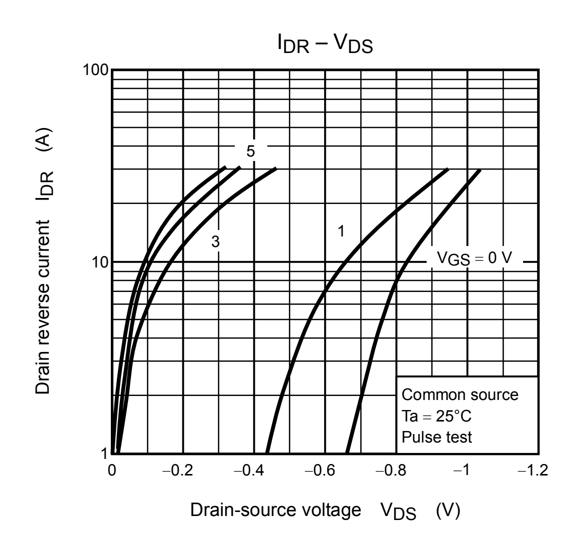

V_{DS} – V_{GS}
Common source
Ta = 25°C
Pulse test
8
4
I_D = 2A
Drain-source voltage V_{DS} (V)
Gate-source voltage V_{GS} (V)


$|Y_{fs}|$ – I_D
−55°C
Tc = 100°C
25°C
Common source
V_{DS} = 10 V
Pulse test
Forward transfer admittance $|Y_{fs}|$ (S)
Drain current I_D (A)

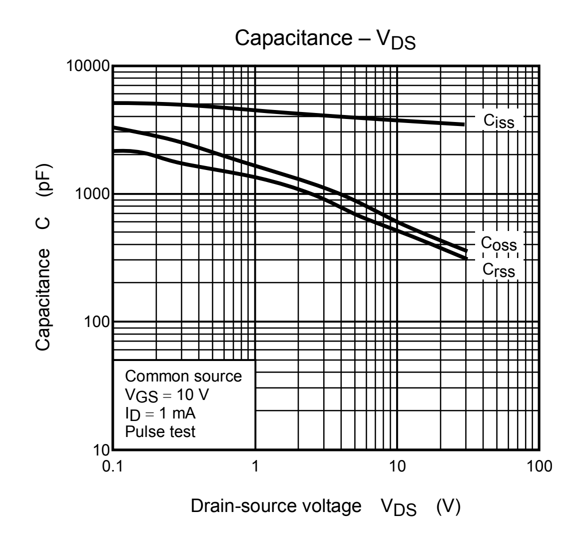

$R_{DS (ON)}$ – I_D
Common source
Ta = 25°C
Pulse test
V_{GE} = 4.5 V
V_{GS} = 10 V
Drain-source ON resistance $R_{DS (ON)}$ (mΩ)
Drain current I_D (A)



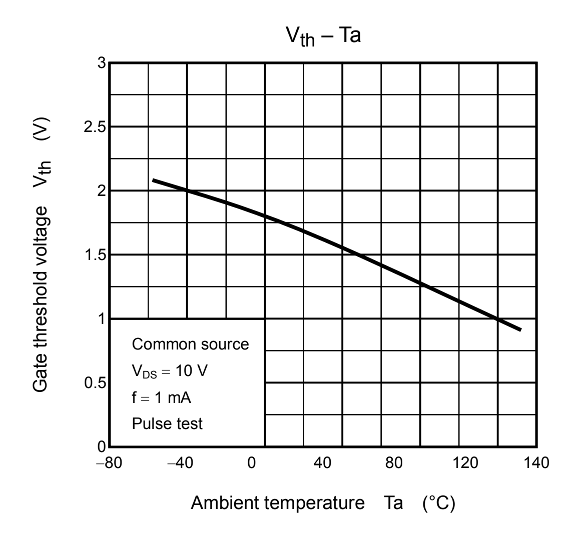
RDS (ON) – Ta
Drain-source ON resistance RDS (ON) (Ω)
ID = 8, 4, 2 A
VGS = 4.5 V
ID = 8, 4, 2 A
10 V
Common source
Pulse test
Ambient temperature Ta (°C)



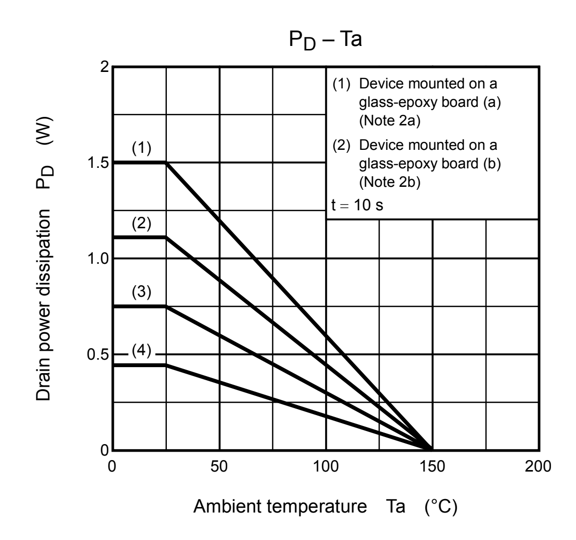
IDR – VDS
Drain reverse current IDR (A)
5
3
1
VGS = 0 V
Common source
Ta = 25°C
Pulse test
Drain-source voltage VDS (V)



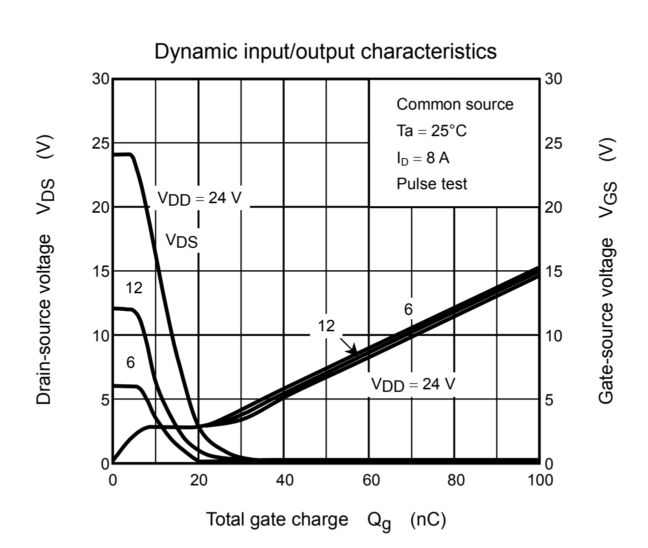
Capacitance – VDS
Capacitance C (pF)
Ciss
Coss
Crss
Common source
VGS = 10 V
ID = 1 mA
Pulse test
Drain-source voltage VDS (V)



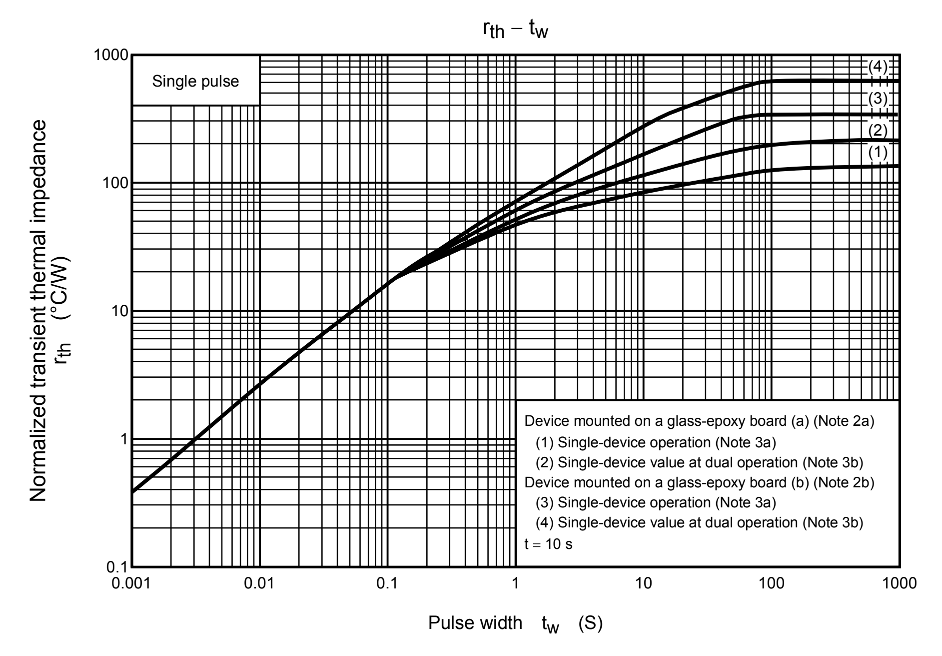
Vth – Ta
Gate threshold voltage Vth (V)
Common source
VDS = 10 V
f = 1 mA
Pulse test
Ambient temperature Ta (°C)



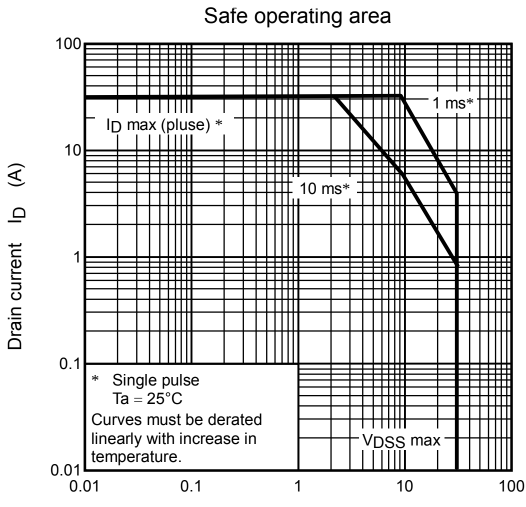
PD – Ta
Drain power dissipation PD (W)
(1) Device mounted on a glass-epoxy board (a) (Note 2a)
(2) Device mounted on a glass-epoxy board (b) (Note 2b)
t = 10 s
(1)
(2)
(3)
(4)
Ambient temperature Ta (°C)



Dynamic input/output characteristics
Drain-source voltage VDS (V)
Gate-source voltage VGS (V)
Common source
Ta = 25°C
ID = 8 A
Pulse test
VDD = 24 V
VDS
12
6
12
6
VDD = 24 V
Total gate charge Qg (nC)



$r_{th} - t_w$
Single pulse
Normalized transient thermal impedance r_{th} (°C/W)
Pulse width t_w (S)
1000
100
10
1
0.1
0.001
0.01
0.1
1
10
100
1000
(4)
(3)
(2)
(1)
Device mounted on a glass-epoxy board (a) (Note 2a)
(1) Single-device operation (Note 3a)
(2) Single-device value at dual operation (Note 3b)
Device mounted on a glass-epoxy board (b) (Note 2b)
(3) Single-device operation (Note 3a)
(4) Single-device value at dual operation (Note 3b)
t = 10 s



Safe operating area
Drain current I_D (A)
Drain-source voltage V_{DS} (V)
100
10
1
0.1
0.01
0.01
0.1
1
10
100
I_D max (pluse) *
1 ms*
10 ms*
V_{DSS} max
* Single pulse
Ta = 25°C
Curves must be derated
linearly with increase in
temperature.

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000707EAA

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